

الف) $y = \frac{\sin x - 2}{2 \cos x + 1} \Rightarrow 2 \cos x + 1 \neq 0 \Rightarrow \cos x \neq -\frac{1}{2}$  $\Rightarrow D_f = \mathbb{R} - \left\{ 2k\pi + \frac{2\pi}{3}, 2k\pi + \frac{4\pi}{3} \right\}$

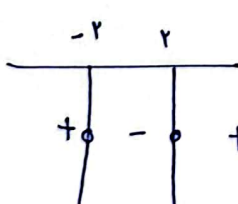
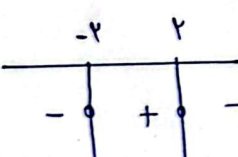
ب) $y = \frac{\sin x + 3}{\cos x - 1} \Rightarrow \cos x - 1 \neq 0 \Rightarrow \cos x \neq 1$  $\Rightarrow D_f = \mathbb{R} - \{ 2k\pi \}$

الف) $y = \frac{2 \sin x + 1}{\tan x + 1} \Rightarrow \tan x + 1 \neq 0 \Rightarrow \tan x \neq -1$  $\Rightarrow D_f = \mathbb{R} - \left\{ k\pi + \frac{3\pi}{4}, k\pi + \frac{7\pi}{4} \right\}$
 $\rightarrow \cos x \neq 0 \rightarrow x \neq k\pi + \frac{\pi}{2}$

ب) $y = \frac{\cos x + 1}{\cot x - 1} \Rightarrow \cot x - 1 \neq 0 \Rightarrow \cot x \neq 1$  $\Rightarrow D_f = \mathbb{R} - \left\{ k\pi + \frac{\pi}{4}, k\pi + \frac{5\pi}{4} \right\}$
 $\rightarrow \sin x \neq 0 \rightarrow x \neq k\pi$

الف) $\sin y = x^2 - 2$ $D_f = \mathbb{R}$ $-1 \leq x^2 - 2 \leq 1 \rightarrow 1 \leq x \leq \sqrt{3}$
 $-1 \leq \sin y \leq 1$ $\rightarrow \sqrt{3} \leq x \leq 1$ (Note: $\sqrt{3} > 1$, so this part is contradictory)
 ب) $y = \arccos(\sqrt{x} - 3) \Rightarrow -1 \leq \sqrt{x} - 3 \leq 1 \Rightarrow 2 \leq \sqrt{x} \leq 4 \Rightarrow 4 \leq x \leq 16$
 $\Rightarrow D_f = (-\infty, 4] \cup [16, +\infty)$

الف) $\cos y = |x| - 3$ $D_f = \mathbb{R}$ $-1 \leq |x| - 3 \leq 1 \rightarrow 2 \leq |x| \leq 4$
 $-1 \leq \cos y \leq 1$ $\rightarrow 2 \leq |x| \leq 4$
 ب) $y = \arcsin(x^2 + 3x + 1) \Rightarrow -1 \leq x^2 + 3x + 1 \leq 1 \Rightarrow -2 \leq x^2 + 3x \leq 0$
 $\Rightarrow x \in [-2, 0]$ $D_f = [-2, 0]$

الف) $y = \log_3(x^2 - 4) \Rightarrow x^2 - 4 > 0 \Rightarrow (x - 2)(x + 2) > 0$ 
 $\Rightarrow D_f = (-\infty, -2) \cup (2, +\infty)$
 ب) $y = \log_2(x^2 - 1) \Rightarrow x^2 - 1 > 0 \Rightarrow (x - 1)(x + 1) > 0$ 
 $\Rightarrow D_f = (-1, 1)$

الف) $y = \log_{\frac{\omega-x}{x-3}} \Rightarrow x < \omega$
 $x > 3, x \neq 4$
 $D_f = (3, \omega) - \{4\}$

ب) $y = \log_{\frac{x^2-1}{x+3}} \Rightarrow \frac{x^2-1}{x+3} > 0$
 $(x-1)(x+1) > 0$
 $x+3 > 0 \Rightarrow x > -3$
 $x+3 \neq 1 \Rightarrow x \neq -2$
 $D_f = (-3, -2) \cup (-2, -1) \cup (1, +\infty)$

الف) $y = \log_{\frac{x^2-4x+3}{x-3}} \Rightarrow \frac{(x-1)(x-3)}{(x-3)} > 0$
 $\Rightarrow D_f = (1, 3) \cup (3, +\infty)$

ب) $y = \log_{\frac{x+3}{x-2}} \Rightarrow \frac{x+3}{x-2} > 0$
 $\Rightarrow x+3 > 0 \Rightarrow x > -3$
 $x+3 \neq 1 \Rightarrow x \neq -4$
 $x-2 \neq 0 \Rightarrow x \neq 2$
 $D_f = (-3, -4) \cup (-4, 2) \cup (2, +\infty)$

الف) $y = \sqrt{2} \log_2 (x-2) \rightarrow x-2 > 0 \Rightarrow x > 2$
 $2 \log_2 (x-2) > 0 \Rightarrow \log_2 (x-2) > 0 \Rightarrow 2 < x-2 \Rightarrow 4 < x$
 $D_f = (4, +\infty)$

ب) $y = \log_{\frac{(x \log_2 x - 1)}{x-1}}$
 $x > 0$
 $x=1 \Rightarrow \frac{0}{0}$
 $x=3 \Rightarrow \frac{-1}{2}$
 $D_f = (3, +\infty)$

الف) $y = \frac{3}{f^x+1} \Rightarrow f^x+1 \neq 0 \Rightarrow f^x \neq -1 \checkmark$
 $D_f = \mathbb{R}$

ب) $y = \frac{3}{f^x-1} \Rightarrow f^x-1 \neq 0 \Rightarrow f^x \neq 1 \Rightarrow x \neq 0$
 $D_f = \mathbb{R} - \{0\}$

ج) $y = \frac{3}{f^x-2} \Rightarrow f^x-2 \neq 0 \Rightarrow f^x \neq 2 \Rightarrow x \neq \log_f 2$
 $D_f = \mathbb{R} - \{\log_f 2\}$

الف) $y = (f^x+1)!$
 $f^x+1 \in \mathbb{N} \Rightarrow x \in \frac{\mathbb{N}-1}{f} \Rightarrow D_f = \{x | x = \frac{k-1}{f}, k \in \mathbb{N}\}$

ب) $y = \left(\frac{3x-2}{2x-5} \right)!$
 $\Rightarrow \left\{ x \mid x = \frac{-5k+1}{2k-3}, k \in \mathbb{N} \right\}$